Technical Sales Document

- Product Data -

A Rolls-Royce solution

Name	20V4000C22	**Speed [rpm]**	1800
Application Group	5B	**Nominal power [kW]**	2720
Dataset	Ref. 25°C/45°C	**Nominal power [bhp]**	3648
		Nominal power [kVA]	-
		Nominal power [kWel]	-
		Frequency [Hz]	-
Exhaust Regulations	EPA Nonroad T1 Comp (40CFR89);		

Reference conditions

No.	Description	Index	Value	Unit
3	MTU data code		1	-
6	Intake air temperature		25	°C
7	Charge-air coolant temperature		45	°C
8	Barometric pressure		1000	mbar
9	Site altitude above sea level		100	m
10	Raw-water inlet temperature		-	°C

[BL] **Reference value: fuel stop power**
Maximum engine power that cannot be run continuously on some applications (stabilization reserve)
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Exhaust Regulations	EPA Nonroad T1 Comp (40CFR89);		

0. Data-relevant engine design configuration

No.	Description	Index	Value	Unit
12	Engine with sequential turbocharging (turbochargers with cut-in/cut-out control)		-	-
13	Engine without sequential turbocharging (turbochargers without cut-in/cut-out control)		X	-

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		Nominal power [kWel]	-
		Frequency [Hz]	-
Exhaust Regulations	EPA Nonroad T1 Comp (40CFR89);		

1. Power-related data

No.	Description	Index	Value	Unit
1	Engine rated speed	A	1800	rpm
3	Mean piston speed		12.6	m/s
7	Net brake power (without fan) (Fuel stop power ISO 3046)	A	2720	kW
16	Mean effective pressure (MEP)		20.2	bar
18	Performance map No.		528000	-
38	Performance map No. (cont.)		1499	-
20	Performance map, amendment index		B	-

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		Nominal power [kWel]	-
		Frequency [Hz]	-
Exhaust Regulations	EPA Nonroad T1 Comp (40CFR89);		

2. General Conditions (for maximum power)

No.	Description	Index	Value	Unit
1	Intake air depression (new filter)	A	25	mbar
2	Intake air depression, max.	L	50	mbar
3	Exhaust back pressure	A	30	mbar
4	Exhaust back pressure, max.	L	50	mbar
5	Fuel temperature at fuel feed connection	R	25	°C
9	Fuel temperature at fuel feed connection, max. (w/o power reduction)	L	45	°C
10	Fuel temperature at fuel feed connection, max.	L	45	°C

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		Nominal power [kWel]	-
		Frequency [Hz]	-

Exhaust Regulations EPA Nonroad T1 Comp (40CFR89);

3. Consumption

No.	Description	Index	Value	Unit
54	Specific fuel consumption (be) - 100 % FSP without fan (+ 5 %; EN 590; 42.8 MJ/kg)	R	197	g/kWh
34	Low-idle fuel consumption	R	13.5	kg/h
92	Lube oil consumption after 100 h of operation (B = fuel consumption per hour) Guideline value does not apply for the design of EGAT systems. Please consult the Applications Center with regard to the layout of EGA systems.	R	0.3	% of B
62	Lube oil consumption after 100 h of operation, max. (B = fuel consumption per hour)	L	1.0	% of B

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		Nominal power [kWel]	-
		Frequency [Hz]	-

Exhaust Regulations EPA Nonroad T1 Comp (40CFR89);

4. Model-related data (basic design)

No.	Description	Index	Value	Unit
3	Engine with exhaust turbocharger (ETC) and intercooler		X	-
4	Exhaust piping, non-cooled		X	-
5	Exhaust piping, liquid-cooled		-	-
6	Number of cylinders		20	-
7	Cylinder configuration: V angle		90	degrees (°)
10	Bore		165	mm
11	Stroke		210	mm
12	Displacement, cylinder		4.49	liter
13	Displacement, total		89.81	liter
14	Compression ratio		15.5	-
24	Number of inlet valves, per cylinder		2	-
25	Number of exhaust valves, per cylinder		2	-
15	Number of turbochargers		2	-
18	Number of intercoolers		1	-
28	Standard flywheel housing flange (engine main PTO)		00	SAE
50	Static bending moment at standard flywheel housing flange, max.	L	15	kNm
51	Dynamic bending moment at standard flywheel housing flange, max.	L	75	kNm

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		Nominal power [kWel]	-
		Frequency [Hz]	-
Exhaust Regulations	EPA Nonroad T1 Comp (40CFR89);		

5. Combustion air / exhaust gas

No.	Description	Index	Value	Unit
1	Charge-air pressure before cylinder (abs.)	R	3.4	bar abs
2	Combustion air volume flow	R	4.1	m³/s
3	Exhaust volume flow (at exhaust temperature)	R	9.2	m³/s
5	Exhaust temperature after turbocharger	R	420	°C

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		Nominal power [kWel]	-
		Frequency [Hz]	-
Exhaust Regulations	EPA Nonroad T1 Comp (40CFR89);		

6. Heat dissipation

No.	Description	Index	Value	Unit
58	Heat dissipated by engine coolant (high-temperature circuit)	A	950	kW
59	Heat dissipated by engine coolant (low-temperature circuit)	A	800	kW
28	Heat dissipated by return fuel flow	A	20	kW
29	Radiation and convection heat, engine	A	105	kW

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		Nominal power [kVA]	-
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		Frequency [Hz]	-

Exhaust Regulations EPA Nonroad T1 Comp (40CFR89);

7. Coolant system (high-temperature circuit)

No.	Description	Index	Value	Unit
17	Coolant temperature (at engine outlet to cooling equipment)	A	95	°C
57	Coolant temperature differential after/before engine, from	R	7	K
58	Coolant temperature differential after/before engine, to	R	9	K
23	Coolant temperature differential after/before engine	L	10	K
20	Coolant temperature after engine, limit 1	L	97	°C
21	Coolant temperature after engine, limit 2	L	99	°C
25	Coolant antifreeze content, max.	L	50	%
30	Cooling equipment: coolant flow rate	A	100	m³/h
35	Coolant pump: inlet pressure, min.	L	0.2	bar
36	Coolant pump: inlet pressure, max.	L	1.5	bar
43	Pressure loss in off-engine cooling system, max. without thermostat	L	0.7	bar
70	Pressure loss in off-engine cooling system, min. without thermostat	L	0.55	bar
45	Flow resistance (X) coefficient engine w/ thermostat, w/o cooling equipment	R	0.27	mbar/(m³/h)²
47	Breather valve (expansion tank) opening pressure (excess pressure)	R	1.0	bar
54	Cooling equipment: height above engine, max.	L	15.2	m
53	Cooling equipment: operating pressure	A	2.5	bar
50	Thermostat, starts to open	R	79	°C
52	Thermostat, fully open	R	92	°C
48	Breather valve (expansion tank) opening pressure (depression)	R	-0.1	bar

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		Nominal power [kVA]	-
		Nominal power [kWel]	-
		Frequency [Hz]	-

Exhaust Regulations EPA Nonroad T1 Comp (40CFR89);

49	Pressure in cooling system, max.	L	5.0	bar

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		Nominal power [kVA]	-
		Nominal power [kWel]	-
		Frequency [Hz]	-

Exhaust Regulations EPA Nonroad T1 Comp (40CFR89);

8. Coolant system (low-temperature circuit)

No.	Description	Index	Value	Unit
53	Coolant temperature (at engine outlet to cooling equipment)	R	68	°C
8	Coolant temperature before intercooler (with max. 40% antifreeze)	A	45	°C
9	Coolant temperature before intercooler (at engine inlet from cooling equipment)	A	45	°C
14	Coolant temperature before intercooler, limit 1	L	68	°C
15	Coolant temperature before intercooler, limit 2	L	-	°C
54	Coolant temperature differential after/before intercooler, min.	L	18	K
55	Coolant temperature differential after/before intercooler, max.	L	25	K
13	Coolant antifreeze content, max.	L	50	%
20	Cooling equipment: coolant flow rate	A	38	m³/h
21	Intercooler: coolant flow rate	R	38	m³/h
24	Coolant pump: inlet pressure, min.	L	0.2	bar
25	Coolant pump: inlet pressure, max.	L	1.4	bar
31	Pressure loss in off-engine cooling system, max. without thermostat	L	0.7	bar
43	Cooling equipment: height above engine, max.	L	10	m
36	Breather valve (expansion tank) opening pressure (excess pressure)	R	1.0	bar
37	Breather valve (expansion tank) opening pressure (depression)	R	-0.1	bar
38	Pressure in cooling system, max.	L	5.0	bar
42	Cooling equipment: operating pressure	A	2.5	bar
39	Thermostat, starts to open	R	45	°C

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		Nominal power [kVA]	-
		Nominal power [kWel]	-
		Frequency [Hz]	-

Exhaust Regulations EPA Nonroad T1 Comp (40CFR89);

41	Thermostat, fully open	R	58	°C

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		Frequency [Hz]	-
Exhaust Regulations	EPA Nonroad T1 Comp (40CFR89);		

10. Lube oil system

No.	Description	Index	Value	Unit
1	Lube oil operating temp. before engine, from	R	86	°C
2	Lube oil operating temp. before engine, to	R	95	°C
5	Lube oil temperature before engine, limit 1	L	97	°C
6	Lube oil temperature before engine, limit 2	L	99	°C
8	Lube oil operating press. bef. engine, from	R	4.8	bar
9	Lube oil operating press. bef. engine, to	R	6.0	bar
10	Lube oil pressure before engine, alarm	L	4.5	bar
11	Lube oil pressure before engine, shutdown	L	3.9	bar
32	Lube oil fine filter (main circuit): pressure differential, max.	L	0.8	bar

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		Nominal power [kWel]	-
		Frequency [Hz]	-
Exhaust Regulations	EPA Nonroad T1 Comp (40CFR89);		

11. Fuel system

No.	Description	Index	Value	Unit
1	Fuel pressure at engine fuel feed connection, min. (when engine is starting)	L	-0.1	bar
2	Fuel pressure at engine fuel feed connection, max. (when engine is starting)	L	1.5	bar
57	Fuel pressure at engine fuel feed connection, min. (when engine is running)	L	-0.3	bar
37	Fuel supply flow, max.	A	30.0	liter/min
8	Fuel return flow, max.	A	15.0	liter/min
10	Fuel pressure at return connection on engine, max.	L	0.5	bar
12	Fuel temperature differential before/after engine	R	45	K
18	Fuel fine filter (main circuit): number of units	A	2	-
19	Fuel fine filter (main circuit): number of elements per unit	A	1	-
20	Fuel fine filter (main circuit): particle retention	A	0.005	mm
21	Fuel fine filter (main circuit): pressure differential, max.	L	1.0	bar

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		Frequency [Hz]	-

Exhaust Regulations EPA Nonroad T1 Comp (40CFR89);

12. General operating data

No.	Description	Index	Value	Unit
1	Cold start capability: air temperature (w/o starting aid, w/o preheating) - (case A)	R	10	°C
2	Additional condition (to case A): engine coolant temperature	R	10	°C
3	Additional condition (to case A): lube oil temperature	R	10	°C
4	Additional condition (to case A): lube oil viscosity	R	10W30	SAE
28	Breakaway torque (without driven machinery) coolant temperature +5°C	R	2600	Nm
30	Breakaway torque (without driven machinery) coolant temperature +40°C	R	2200	Nm
29	Cranking torque at firing speed (without driven machinery) coolant temperature +5°C	R	1300	Nm
31	Cranking torque at firing speed (without driven machinery) coolant temperature +40°C	R	1100	Nm
36	Minimum idling speed	A	600	rpm
38	Limit speed for overspeed alarm / emergency shutdown	L	2050	rpm
42	Firing speed, from	R	80	rpm
43	Firing speed, to	R	120	rpm
44	Engine coolant temperature before starting full-load operation, recommended min. (for emergency/standby sets with coolant preheating the minimum preheating temperature referred to extended property No.22 is sufficient)	R	60	°C
51	Engine mass moment of inertia (with standard flywheel)	R	30.9	kgm²
95	Number of starter ring-gear teeth on engine flywheel		182	-

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- Product Data -

A Rolls-Royce solution

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Application Group	5B	**Nominal power [kW]**	2720
Dataset	Ref. 25°C/45°C	**Nominal power [bhp]**	3648
		Nominal power [kVA]	-
		Nominal power [kWel]	-
		Frequency [Hz]	-

Exhaust Regulations EPA Nonroad T1 Comp (40CFR89);

13. Starting (electric)

No.	Description	Index	Value	Unit
2309	Manufacturer		Bosch	-
2310	Number of starter		2	-
2312	Starter electrically redundant		-	-
2313	Rated power per starter	R	11.3	kW
2314	Starter, rated voltage	R	24	VDC
2315	Rated short-circuit current per starter	L	2190	A
2316	Power consumption per starter (at an engine speed of 100 rpm)	R	750	A
2317	Internal resistance of power supply + line resistance per starter	A	0.0047	Ω
2347	Generally valid data for starter		X	-
2342	Rated starting-attempt Duration (at +20°C ambient temperature with battery full)	R	5	s
2343	Interval between starts (at rated starting-attempt duration), min.	L	20	s
2345	Maximum acceptable starting-attempt duration	L	15	s
2344	Interval between starts (when starting-attempt duration > rated starting-attempt duration)	R	60	s
2346	Starting attempts within 30 minutes (at +20°C ambient temperature with battery full), max.	L	6	-

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		Nominal power [kVA]	-
		Nominal power [kWel]	-
		Frequency [Hz]	-

Exhaust Regulations EPA Nonroad T1 Comp (40CFR89);

15. Starting (pneumatic/oil pressure starter)

No.	Description	Index	Value	Unit
5	Starting air pressure before starter motor, min.	R	8	bar
6	Starting air pressure before starter motor, max.	R	9	bar
7	Starting air pressure before starter motor, min.	L	8	bar
8	Starting air pressure before starter motor, max.	L	9	bar
18	Start attempt duration (engine preheated)	R	3	s
20	Start attempt duration, max.	L	5	s
21	Air consumption/start attempt (engine preheated)	R	0.65	m³n
22	Air consumption/start attempt (engine not preheated)	R	0.75	m³n
23	Starting air tank for 3 start attempts (max. 40 bar) (engine preheated)	R	80	liter
24	Starting air tank for 3 start attempts (max. 30 bar) (engine preheated)	R	115	liter
25	Starting air tank for 6 start attempts (max. 40 bar) (engine preheated)	R	160	liter
26	Starting air tank for 6 start attempts (max. 30 bar) (engine preheated)	R	235	liter
27	Starting air tank for 10 start attempts (max. 40 bar) (engine preheated)	R	265	liter
28	Starting air tank for 10 start attempts (max. 30 bar) (engine preheated)	R	380	liter
29	Starting air tank for 3 start attempts (max. 40 bar) (engine not preheated)	R	92	liter
30	Starting air tank for 3 start attempts (max. 30 bar) (engine not preheated)	R	132	liter
31	Starting air tank for 6 start attempts (max. 40 bar) (engine not preheated)	R	185	liter

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		Nominal power [kVA]	-
		Nominal power [kWel]	-
		Frequency [Hz]	-

Exhaust Regulations EPA Nonroad T1 Comp (40CFR89);

32	Starting air tank for 6 start attempts (max. 30 bar) (engine not preheated)	R	270	liter
33	Starting air tank for 10 start attempts (max. 40 bar) (engine not preheated)	R	305	liter
34	Starting air tank for 10 start attempts (max. 30 bar) (engine not preheated)	R	440	liter

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		Nominal power [kVA]	-
		Nominal power [kWel]	-
		Frequency [Hz]	-
Exhaust Regulations	EPA Nonroad T1 Comp (40CFR89);		

16. Inclinations - standard oil system (ref.: waterline)

No.	Description	Index	Value	Unit
15	Longitudinal inclination, continuous max. driving end down (Option: max. operating inclinations)	L	10	degrees (°)
17	Longitudinal inclination, continuous max. driving end up (Option: max. operating inclinations)	L	10	degrees (°)
19	Transverse inclination, continuous max. (Option: max. operating inclinations)	L	22.5	degrees (°)

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		Nominal power [kVA]	-
		Nominal power [kWel]	-
		Frequency [Hz]	-

Exhaust Regulations EPA Nonroad T1 Comp (40CFR89);

18. Capacities

No.	Description	Index	Value	Unit
1	Engine coolant capacity (without cooling equipment)	R	205	liter
10	Intercooler coolant capacity	R	55	liter
11	On-engine fuel capacity	R	10	liter
14	Engine oil capacity, initial filling (standard oil system) (Option: max. operating inclinations)	R	380	liter
20	Oil change quantity, max. (standard oil system) (Option: max. operating inclinations)	R	315	liter
28	Oil pan capacity, dipstick mark min. (standard oil system) (Option: max. operating inclinations)	L	268	liter
29	Oil pan capacity, dipstick mark max. (standard oil system) (Option: max. operating inclinations)	L	315	liter

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		Nominal power [kVA]	-
		Nominal power [kWel]	-
		Frequency [Hz]	-
Exhaust Regulations	EPA Nonroad T1 Comp (40CFR89);		

19. Masses / dimensions

No.	Description	Index	Value	Unit
1	Engine dry mass (standard scope of supply)	R	9865	kg

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		Nominal power [kVA]	-
		Nominal power [kWel]	-
		Frequency [Hz]	-
Exhaust Regulations	EPA Nonroad T1 Comp (40CFR89);		

21. Exhaust emissions

No.	Description	Index	Value	Unit
1955	Emissions data sheet: US EPA Tier1		EDS40000491	-

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		Nominal power [kVA]	-
		Nominal power [kWel]	-
		Frequency [Hz]	-

Exhaust Regulations EPA Nonroad T1 Comp (40CFR89);

23. TBO and load profile (case A)

No.	Description	Index	Value	Unit
1	TBO (Time between Overhaul) (related to standard load profile (Pn,tn))	L	20000	h
2	P1 (percent load related to FSP)	R	100	%
3	t1 (percentage of operating time)	R	17	%
4	P2 (percent load related to FSP)	R	80	%
5	t2 (percentage of operating time)	R	13	%
6	P3 (percent load related to FSP)	R	20	%
7	t3 (percentage of operating time)	R	15	%
8	P4 (percent load related to FSP)	R	<15	%
9	t4 (percentage of operating time)	R	55	%
17	P5 (percent load related to FSP)	R	-	%
18	t5 (percentage of operating time)	R	-	%

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